Mr. Casimir de Candolle repeated, before the members who were present, some experiments to show how sand-ripples at the bottom of our lakes are formed. These facts were applied, in accordance with the ideas of Professor Strasburger of Bonn, to explain certain appearances of envelopes and vegetable cells in fossils.

Mr. Raoul Pictet presented an experimental demonstration of the second law of thermo-dynamics, deduced from the simultaneous working of steam-engines and frigorific apparatus.

Professor Weber of Zurich presented two interesting papers: one, on a dynamic method for the exact measurement of the coefficient of conductibility of heat in liquids; the other paper, on the apparatus for measuring electric units.

Mr. H. Dufour of Lausanne distributed among the audience a set of photographs showing the electric condition of the air, which were obtained by means of a registering electrometer in the new physical laboratory at Lausanne. These curves are so connected with the condition of the heavens, that it is no exaggeration to expect to predict the weather several days in advance, through a careful examination of the variations of electric tension of the air. For fine weather, the electric tension is strong; it sensibly decreases during and before storms; the rapid falling of the curve of the electric potential of the air is always an indication of rain or storm.

The late hour made it impossible to listen to five additional communications which had been announced. The boat for an excursion on the lake awaited its guests; science paled before the beauties of nature. Though continuing to converse on the subjects treated, we all together betook ourselves to the pier. The excursion was delightful. On our return, the streets were illuminated; Bengal and electric lights mingled their dazzling rays. The citizens of Zurich gave us a magnificent reception; and the *fête*, enlivened by an excellent orchestra, was continued to a late hour.

The next morning, Thursday, we listened to three scientific papers which closed the intellectual part of the reunion.

The honors of that morning belong to Professor Suess of Vienna. With consummate skill he set before us the chief points of the modern theory of the upheaval of mountains: he held his audience with great ease, and left a refreshing memory with all who heard him.

This paper, with that of Mr. Heer which followed, will be issued in full in the memoirs of the society.

The afternoon was given up to leave-takings. Seated around the long tables of the hotel L'Uetliberg, thanks and farewell were said again and again. Toasts of gratitude, toasts to the absent, to the present, to Clausius, to Mousson, Oswald Heer, and Studer, founders of the society, were applauded by all, glass in hand.

Appended to this account, appears a list of the principal papers offered in the other sections.

In the botanical section, Professor Heer spoke of the cretaceous and tertiary flora of Greenland; Mr. Schnetzler, of a Chinese primrose in which the sexual organs corresponded to an earlier stage in the evolution of Primulaceae, and on certain relations between an aërial alga and lichen; Mr. Favrat discussed the hybrids of two species of primrose and of other plants, and called attention to the changes in a Cardamines growing in turfy soil. Mr. Andreae spoke of pasturage on the Jura; and Mr. Casimir de Candolle drew attention to a curious Cytisus bearing both red and yellow flowers.

In the chemical section, Professor Krafft read a paper on the preparation of saturated alcohols; Professor Soret, on the absorption of the ultra-viole rays by the albuminoid substances; Professor Schulze, on the composition of cheese; and on phenylamido-propionic acid; Prof. Victor Meyer gave a new method for determining the vapor density of Cl. Br. I. for high temperatures, and reported on a new series of bodies, which he termed *thyophènes*, contained in benzol. Professor Wislicenus of Wurzburg offered a contribution to the theory of Van t'Hoff; and made a communication on the action of chloride of phtalyle and of phtalic anhydride on the ethers of malic acid; Professor Schaer recalled the forgotten works of De Saive (in 1756) on zinc combustion; Dr. Goldschmidt showed the action of hydroxylamine on ketones; Dr. Ceresole spoke of acetacetic acid; Professor Lunge, of the manufacture of sulphuric acid; Dr. Schumacher gave analyses of foods; and Dr. Urech exhibited a laboratory-lamp.

In the geological sections, papers were offered by Messrs. Favre, Neumayr, Schardt, Goll, Mühlberg, Fellenberg, Jaccard, Koch, Chevannes, Mösch, Fratech, and Suess.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Geology of Philadelphia.

In Dr. Frazer's notice of my lecture upon the geology of Philadelphia, there is so little of adverse criticism, that it may seem ungracious to reply to the few points regarded as blemishes. Merely in defence of the use made of certain terms called in question, a few words here may not be out of place.

In describing the Philadelphia gneiss as both Huronian and Mont Alban, there is no confusion, if, as is held by many geologists, the former term is generic, the latter specific.

The term 'creep,' as applied to the pulling-over of softened or broken strata downhill, by the action of gravity, frost, etc., is one frequently used in describing such phenomena in regions south of glacial action. It is used repeatedly in this sense, in a report issued by the Geological survey of Pennsylvania, in 1880.

The term 'hydro-mica slates,' objected to, is not only used by Rogers, Lesley, Dana, Hall, and others, but occurs repeatedly in Dr. Frazer's recent geological reports on Lancaster and Chester counties, being used by himself.

The positive statement regarding the absence of glaciation in Pennsylvania south of the terminal mo-

raine (the immediate 'fringe' in the western part of the state excepted) was made because of certain statements to the contrary quite recently made by a distinguished authority. It was made only after a thorough investigation of every locality supposed to be glaciated.

In conclusion, I may be permitted to say that while, owing to the necessarily limited length of a public lecture, the rocks of Philadelphia could not be so fully treated of as the superficial formations, this latter — and in this region more debatable — subject will form the topic of future lectures, which may perhaps be worthy of further comment by my friendly critic. HENRY CARVILL LEWIS.

Philadelphia, Sept. 7, 1883.

The pre-Cambrian rocks of Wales.

Those who are interested in the questions raised by Dr. Henry Hicks in his criticism of Professor Geikie in SCIENCE for Aug. 10, may find it to their advantage to consult my paper entitled 'History of some pre-Cambrian rocks in Europe and America,' which appeared in the *American journal of science* for April, 1880 (vol. xix. p. 268–283). I had the good fortune, in 1878, to spend several days with Dr. Hicks, in going over the typical localities previously studied by him, not only at and near St. Davids in South Wales, but also those of Carnarvon, Dinorwic, and Anglesea, Messrs. Tosell and Tawney being our companions, in North Wales. As a result of these studies, I am satisfied that the views of Messrs. Hicks and Hughes are correct, and their criticisms of Professor Geikie well founded.

The Dimetian, alike in North and South Wales and in Anglesea, has both the lithogical characters and the stratigraphical relations of the Laurentian of North America. The Arvonian corresponds in like manner to the great series of *hälleflintas* or petrosilex rocks, jaspery and porphyritic, whose distribution on the coast of Massachusetts and of New Brunswick, in the Blue Ridge of Pennsylvania, in Missouri, and on Lake Superior, I have studied and elsewhere discussed (*Second geol. surv. Penn.*, rep. E, p. 189–195). Similar rocks have also been described by Irving in the Baraboo river in central Wisconsin, a locality which I have lately had an opportunity of examining. The conglomerates of Arvonian pebbles, which form the basal beds of the Cambrian near Snowdon, are indistinguishable from those found at Marblehead and elsewhere on our eastern coast, lying on or near the Arvonian.

The Pebidian of Hicks is our typical Huronian, as seen in eastern Canada and around the lakes Huron and Superior. Professor Bonney, who has lately received a collection of these, is struck with their complete resemblance to the Welsh Pebidian which I had seen and called Huronian thirteen years since. The succeeding gneisses and mica-schists (upper Pebidian or Grampian of Hicks, and Caledonian of Callaway), which are our Montalban series, are not met with in Wales, but appear not only in Scotland, but, as I have pointed out, across the channel, in the Dublin and Wicklow hills in Ireland.

The similar succession in the Alps, I have described in a late paper, of which an abstract appeared in SCIENCE for Sept. 7 (p. 322). The student who compares the succession of stratified crystalline rocks alike in North America, in the British Islands, and in southern Europe, can scarcely fail to recognize, in their constant stratigraphical and lithological relations, something like a 'universal law.'

T. STERRY HUNT.

Montreal, Sept. 11, 1883.

SERGEANT FINLEY'S TORNADO STUDIES.

Report on the character of six hundred tornadoes. Professional papers of the signal service, No. vii. By J. P. FINLEY, Washington, *Signal service*, 1882. 19 p., 3 maps, 4°.

Tornadoes: Their special characteristics and dangers. By J. P. FINLEY. Kansas City, 1882. 30 p.

So striking a phenomenon as a tornado, and one so destructive in its effects, would naturally receive much attention; yet, curiously enough, the competent treatment which these storms have received is remarkably inadequate. Those omniscient gentlemen, the reporters of the newspapers, have written much about tornadoes, and many columns of our summer dailies are filled with accounts of them; but, aside from the books of Peltier and Reye, the scientific literature is fragmentary. Half a century ago, at the time of the battle between Reid, Redfield, Piddington, Espy, Hare, and others, over the rotatory theory of storms, the tornado-literature took a considerable development; but it soon fell to small dimensions, and here it has remained until quite recently. The present activity in this field is largely due to the signal service, and Sergeant Finley's contributions form an important part of the current literature.

Mr. Finley's specialty is the collection of facts concerning tornadoes. He has accounts of individual tornadoes in many of the annual reports of the chief signal officer. They represent the facts collected by him on the field of destruction itself. They are evidently gotten together with great care; measurements are made when practicable, and explanatory maps and sketches are numerous. His evident object is to put before the reader the accurate representation of what he saw, encumbered as little as possible by explanatory theories. The result is that his reports are interesting reading, and afford a mine of wealth for the future Kepler of tornadoes.

Not quite so important, perhaps, from a scientific point of view, but of far more general interest, is his report. Its principal feature is the tabulation of the tornadoes discussed, with headings for time, dimensions, velocity, clouds, and other meteorological features. These are summed up, and from the results are drawn various interesting conclusions concerning maxima, minima, and averages.

Mr. Finley's search for accounts of tornadoes has been extensive; but as he has unfortunately given no references, we cannot tell how extensive it may have been. Evidently he has not gone through the Proceedings of the Amer-